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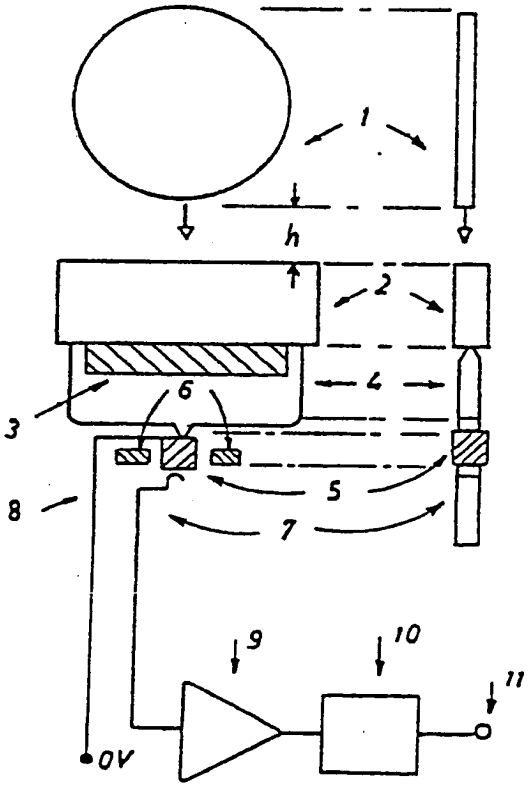
(54) Title: A PROCEDURE FOR CLASSIFICATION OF COINS ACCORDING TO THEIR MECHANICAL ELASTICITY

(57) Abstract

A procedure for sorting current from non-current coins consists in determining the mechanical elasticity of the coin. This is peformed by letting the coin (1) fall through a well-defined distance (h) onto a beam (2) which is brought into oscillation. Through a fork (4) the oscillations are transferred to a piezo-electric element (5) the electric signal of which is amplified, the level of the amplified signal being determined (10). A coin of lead gives a smaller signal amplitude than does a coin of nickel silver of the same diameter.



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A procedure for classification of coins according to their mechanical elasticity.

The invention relates to a procedure for classifying coins according to their mechanical elasticity.

In coin sorters, in particular in machines where coins are used as a means for payment, and where it is of importance to be able to reject non-current or counterfeit coins, each coin is subjected to a number of tests, each test having an acceptance range. Usually the diameter, thickness, and weight are tested. However in certain cases it is still possible to counterfeit coins by letting cheap metal discs have the same properties. For that reason the conductivity of the coin is tested similarly by letting the coin pass through a braking magnetic field, a good conductor being braked more efficiently than a poor conductor. However, cases are known where a lead disc may simulate a coin of German silver (also known as nickel silver) in which cases no rejection takes place.

It has been tried to make use of oscillations set up in a coin after having struck a hard surface, such oscillations being dependent on the material of the coin. To that end US patents 2,317,351 and 4,096,933 specify that a microphone is placed adjacent to the hard surface in order to pick up the sound of the coin having been struck and being in mid-air. However, there is a requirement for certain sound-insulation, and the various circuits for detecting the frequency of self-oscillation are quite complex.

It is the purpose of the invention to avoid the disadvantages of known coin sorters and using other physical properties that differentiate coin materials, in this case the mechanical elasticity and inner damping. This is obtained in a procedure according to the invention according to which the coin is allowed to fall through a well-defined distance onto a prismatic body, the amplitude of the oscillation excited therein being detected, and an amplitude exceeding a defined limit classifying the coin as having a first elasticity, and an amplitude below said limit classifying the coin as having a second elasticity.

Claim 2 specifies the material for the prismatic body in order to simplify the amplitude detection.

The invention is to be described in greater detail in the following with reference to the drawing which schematically shows the procedure in practical use.

In the drawing is shown how the mechanical elasticity may be detected. A coin (1) falls through a well-defined distance (h) under the influence of gravity and hits a prismatic body which is supported by a rib (3). Dependent on the mass of the prismatic body (2) the rib (3) may be resilient or hard, and its length may be varied. The mass of the prismatic body (2) may also be varied, an interval being shown by the the fact that masses corresponding to half the mass of a coin have worked in the procedure as have masses corresponding to double the mass of the coin. It is a simple matter for the person skilled in the art to vary these parameters according to the requirements of the application. A fork (4) transmits the oscillations excited in the prismatic body (2) by the hitting of the coin (1) to a piezoelectric element (5). The piezoelectric element is suspended freely between contact springs (7) and (8) and guide ribs (6). The electrical signal from the piezo-electric element is amplified in an amplifier (9) and is classified by means of a level detector (10). It is obvious to the person skilled in the art that detection of the oscillation may also be performed electrodynamically or by any other suitable oscillation detection means, with suitable changes in the amplifier (9).

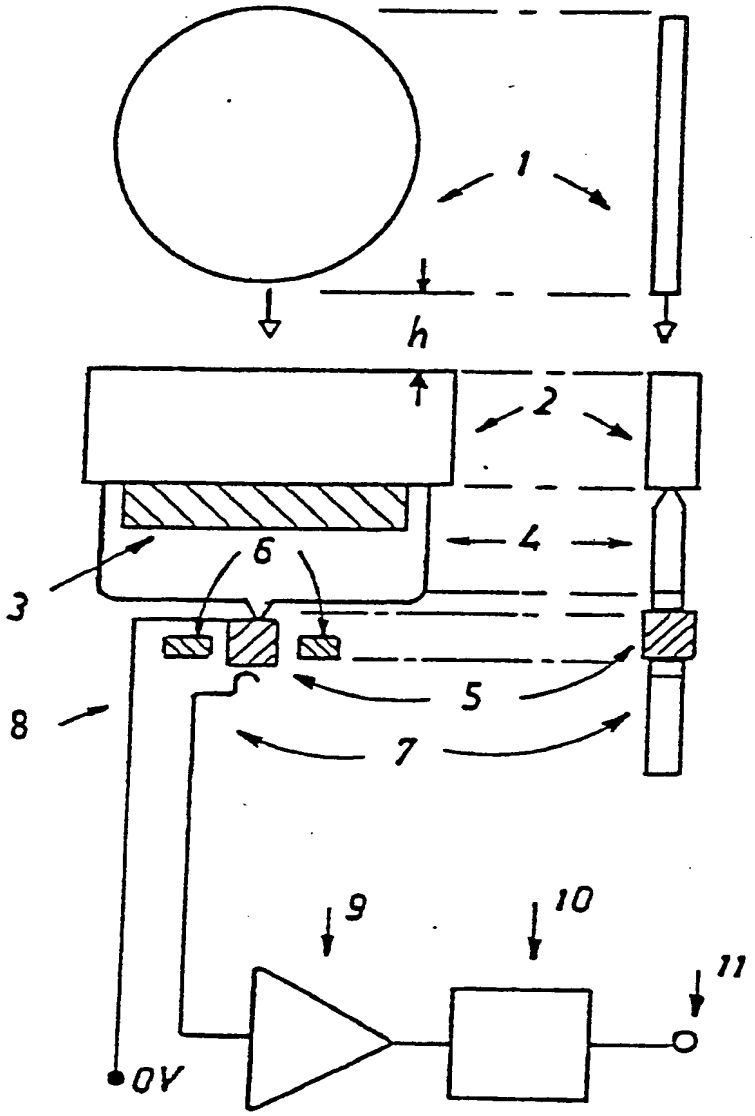
When the coin (1) strikes the prismatic body (2) mechanical oscillations therein are excited, the amplitude of which for a given coin size is dependent on the mechanical elasticity of the coin. A lead disc of a certain diameter will give rise to oscillations having a lesser amplitude than a nickel silver coin of the same diameter. The amplitude may be influenced by the choice of material for the prismatic body. One may in certain cases obtain a simpler classification in the level detector (10) if a material having a large inner damping is used, since this influences the transfer of energy from the falling coin to the oscillating body with a change in the duration of the oscillation as a consequence.

The level detector (10) only gives an output signal on the terminal (11) in case the amplitude of the mechanical oscillations in the prismatic body exceed a certain level. This signal may be used in the further processing of the value of the coin as an acceptance signal.

PATENT CLAIMS

1. A procedure for classification of coins according to their mechanical elasticity, characterized in that a coin (1) is allowed to fall through a well-defined distance (h) onto a prismatic body (2), the amplitude of the oscillation excited therein being detected, an amplitude exceeding a defined limit classifying the coin as having a first elasticity, and an amplitude below said limit classifying the coin as having a second elasticity.

2. A procedure according to claim 1, characterized in that the prismatic body (2) has a large inner damping.



INTERNATIONAL SEARCH REPORT

International Application No PCT/DK82/00072

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC 3

G 07 D 5/06, G 07 F 3/02

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC 3	G 07 D 5/00, 5/06, G 07 F 3/02
National Cl	43a:19; 43b:2/01, 2/02
US Cl	73:163; 194:100

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [5]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category [6]	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
X	DE, A, 2 005 038 (W H MÜNZPRÜFER WALTER HANKE) 12 August 1971	1
X	DE, A, 2 015 491 (WALTER HANKE, MECHANISCHE WERKSTÄTTE) 14 October 1971	1
A	US, A, 2 022 180 (T BRAUN ET AL). 26 November 1935 & DK 50 086 & DE 625 290	1
A	US, A, 2 160 751 (B E MILLS) 30 May 1939	1
A	US, A, 2 247 488 (J GOTTFRIED ET AL) 1 July 1941	1, 2
X	US, A, 2 317 351 (B A ANDALIKIEWICZ ET AL) 27 April 1943 & SE 118 741	1, 2
X	US, A, 4 096 933 (F MASSA) 27 June 1978	1, 2

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IV CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
1982-10-21	1982 -10- 26
International Searching Authority [1]	Signature of Authorized Officer [20]
Swedish Patent Office	C-A Lannefors

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